

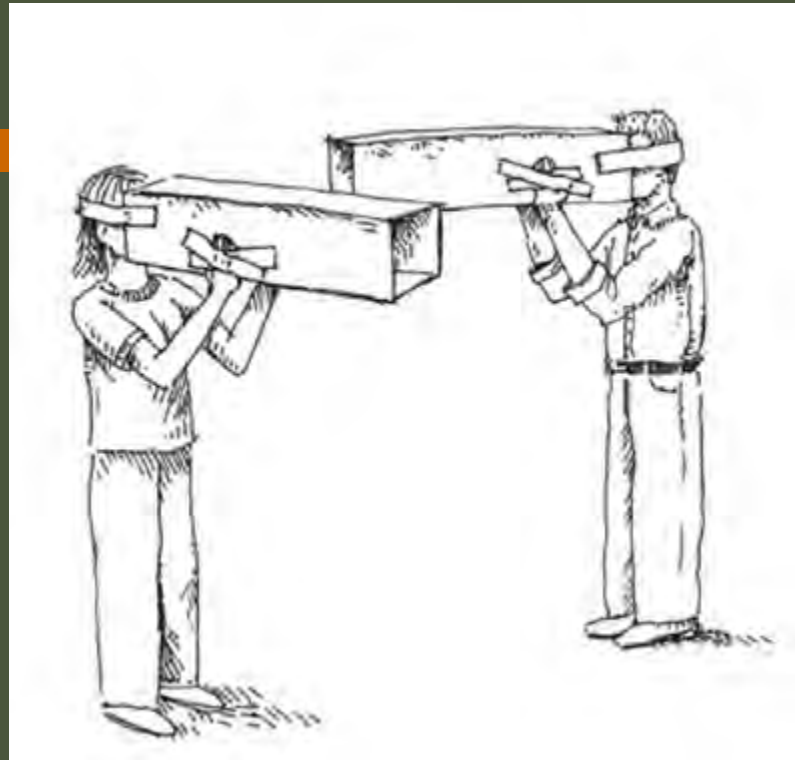
The Road Safety Audit Experience



Aaron Johnson – MDOT Superior Region - Ishpeming TSC

Why have an RSA?

“We already know what the problems are here.
We already know what we want to do.”



Organizing the RSA

Engineering

Enforcement

EMS

Maintenance

Local Officials

*Adjacent property
owners*

*Schools – Bus
Drivers*



Preparing for the RSA

Location for Meeting

Large Van

Existing Plans

Crash History with UD-10s

Background Information

Proposed Project/Plans



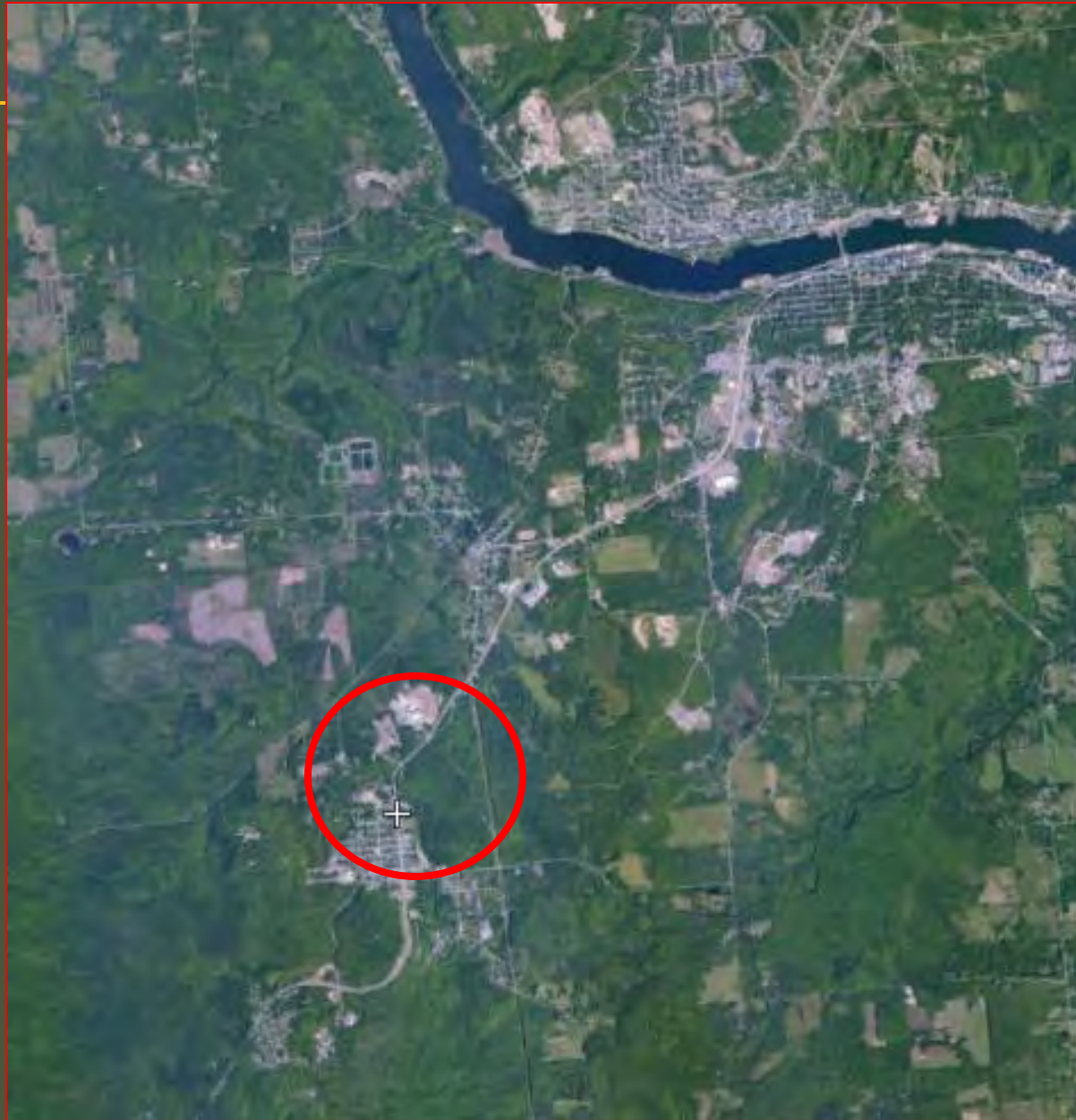
Two Example RSAs

*M-26, South
Range, Houghton
County*

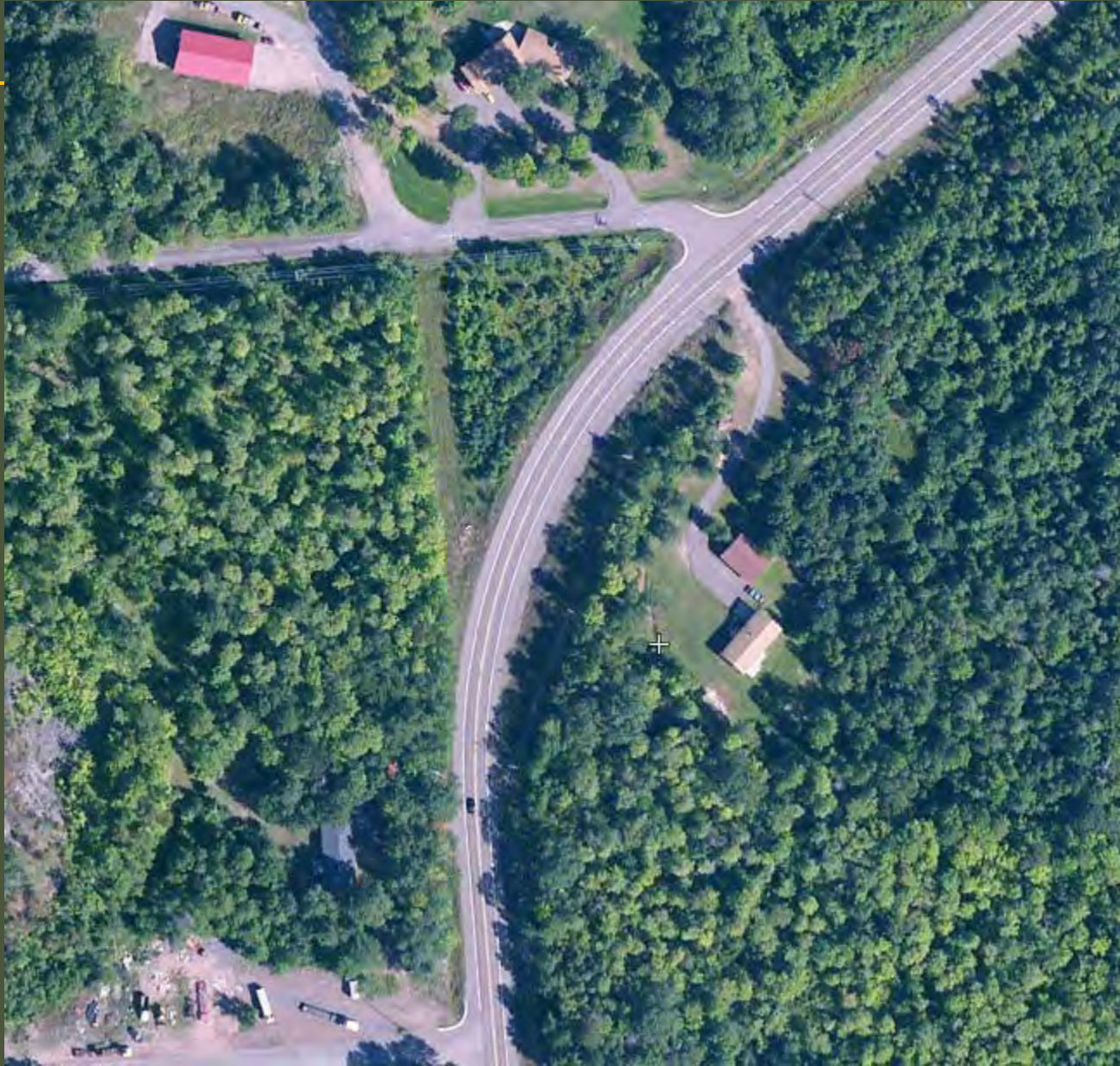
*M-553, Sands
Township,
Marquette County*



M-26 South Range



M-26 South Range



M-26 South Range



Curve Visibility - NB



Curve Visibility



Signing



Destination Sign - NB

Short Term Fixes - Signing



- *Relocated Destination Sign away from curve*

Short Term Fix – Improve signing



- *Target Arrow Sign (W1-6)*
- *Larger Chevrons*

Short Term Fixes - Signing



Short Term Fixes - Signing



Geometrics of the Curve



Insufficient radius, superelevation, and sight distance

Geometrics of the Curve



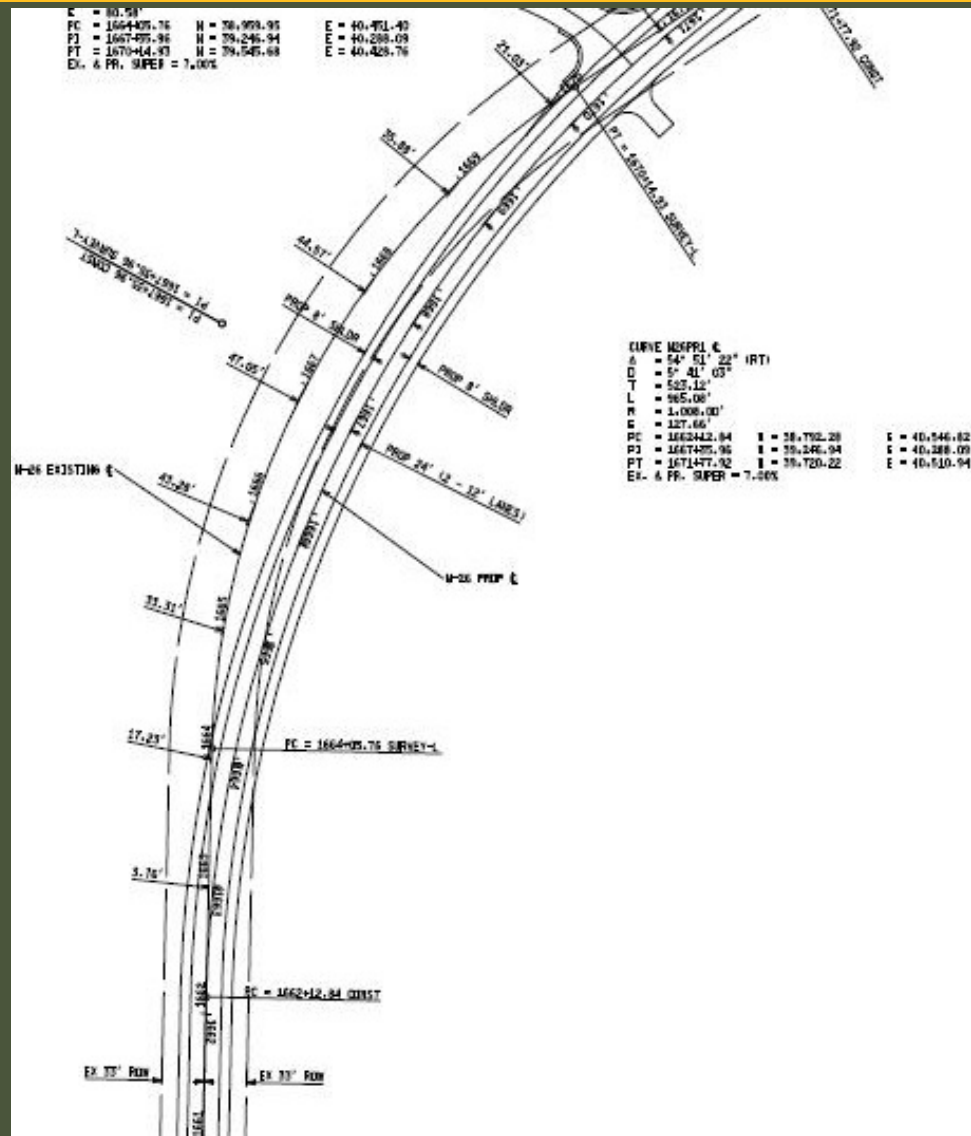
Long Term Fix – Vertical Curve Flattening



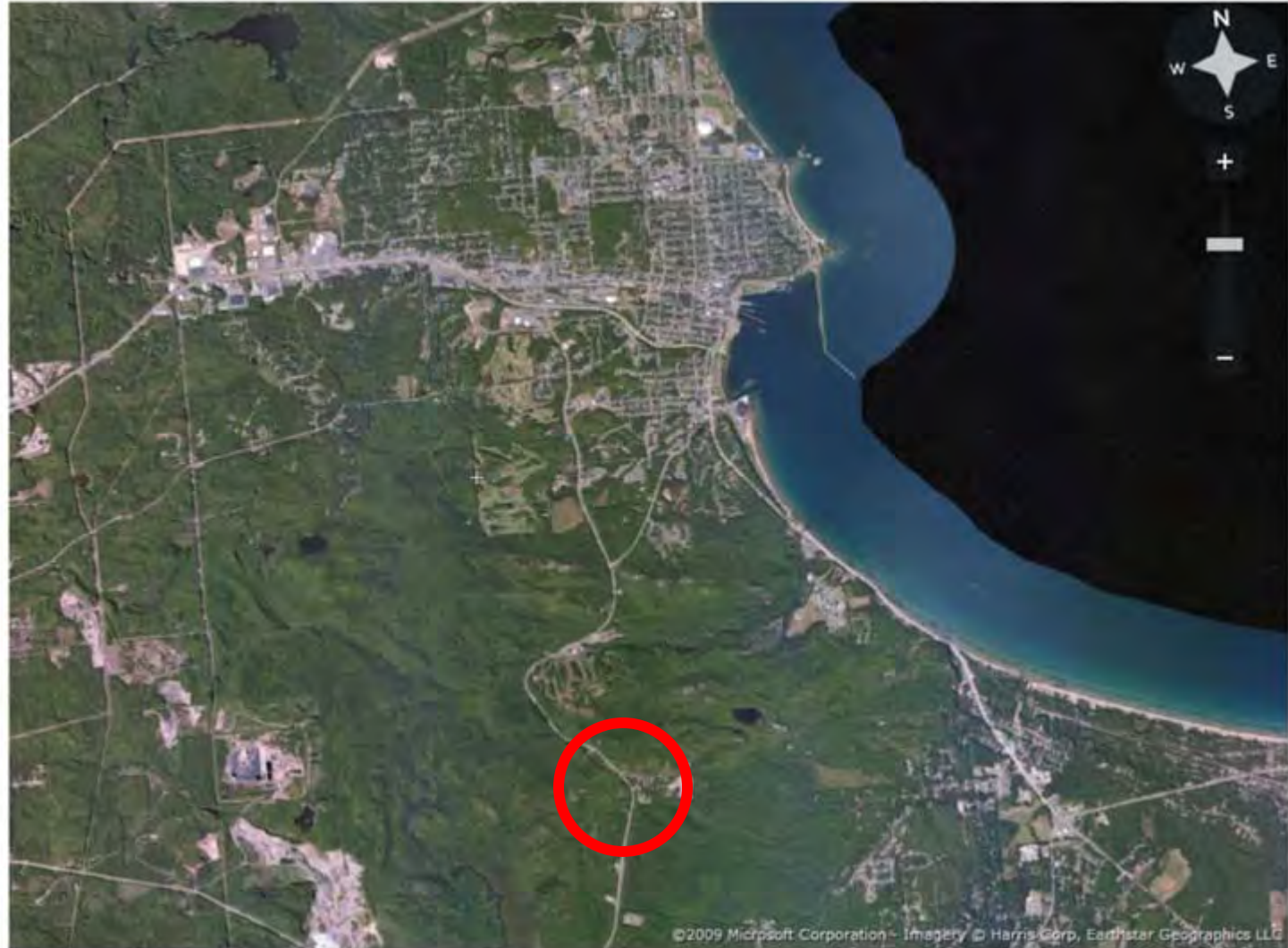
- *Eliminate crest vertical curve to provide approach visibility of horizontal curve*



3. Geometrics of the Curve



M-553, Marquette County



M-553, Sands Township

Marquette Mountain



M-553 Curves



Steep Grades, Lake Effect Snow







Crashes — 5 years 2007-2011

Norway women killed in crash

January 17, 2011

By JOHANNA BOYLE, For The Daily News

Save |  SHARE   

MARQUETTE - Two Norway women were killed and two others injured in a two-vehicle accident on M-553 late Saturday morning. The accident caused the road to be closed for about 2 1/2 hours.

According to the Marquette County Sheriff's Office, at about 11:30 a.m. a 1999 Dodge Caravan with three occupants was traveling south on M-553 about a mile and a half south of Marquette Mountain near Glasses Curve when the driver lost control and the vehicle crossed the centerline, hitting a guardrail and a northbound 2005 Chrysler Pacifica.

The Dodge sustained major damage to the passenger side of the vehicle and all three occupants, all of Norway, had to be extricated.

Diane Smith, 49, and her daughter Nicole Smith, 26, the passengers in the right front seat and rear seat, were transported to Marquette General Hospital, where they were pronounced dead.



Police officers survey the scene of a two-vehicle crash Thursday morning along M-553 in Sandy Township. A 2005 Chrysler Pacifica struck by a 1999 Dodge Caravan, which was traveling south on M-553, was found in fair condition Friday at Marquette General Hospital. (Photo by Matt Fournier)

M-553 crash kills Gwinn man

CHRYSLER 2005 PACIFICA

Police blame slick conditions for accident, injury in back seat of car in fair condition

By JOHN PETER

Journal Staff Writer

MARQUETTE — The Marquette County Sheriff's Office has released the names of those involved in a two-vehicle crash that resulted Thursday morning along M-553, killing a 20-year-old Gwinn man and leaving his 16-month-old daughter.

The Gwinn man pronounced dead at the scene of the accident, the Sheriff's Office said. The victim's name is not being released.

Witnesses said the victim was in the back seat of the car, which was in fair condition. The car was found in fair condition Friday at Marquette General Hospital. (Photo by Matt Fournier)

The car was found in fair condition Friday at Marquette General Hospital. (Photo by Matt Fournier)

See Crash p. 7A

Walker calls it a career

Wiese the new county prosecutor; Hill named to take Wiese's place on staff

By JOHN PETER

Journal Staff Writer

MARQUETTE —



"The gathering is well-attended," says Hill. "It is a good sign for the county."



5 Year Crash Listing 2007-2011

REG ION	CS NUM	CS MP	PR NUM	PR MP	AREA	LOCA TION	CRASH TYPE	DIRECTION OF VEHICLE1	IMPACT OF VEHICLE1	INTENT OF VEHICLE1	DIRECTION OF VEHICLE2	IMPACT OF VEHICLE2	INTENT OF VEHICLE2	WEA THER	SURFACE COND ITION	DAY	HOUR	DATE	CRASH ID NUMBER	A	B	C	PDQ	TOTAL INJ	TOTAL FATAL	TOTAL INVOL
uperl	52055	14.754	1561008	4.754	Mid-block	straight, unrel	FXOBJ	Unknown	Rear Corner;	Going Straight	Unknown	Uncoded Errors	Uncoded Error	Snow /		Mon	1000	12/14/2009	7494314	0	0	0	Y	0	0	No
uperl	52055	14.754	1561008	4.754	Mid-block	straight, unrel	FXOBJ	South	Other Unknown	Going Straight	Unknown	Uncoded Errors	Uncoded Error	Snow /	Snowy	Tue	0650	10/13/2009	7427425	0	0	0	Y	0	0	No
uperl	52055	14.754	1561008	4.754	Mid-block	straight, unrel	FXOBJ	North	Front Corner; D	Going Straight	Unknown	Uncoded Errors	Uncoded Error	Snow /	Slushy	Thu	0920	12/01/2011	8203921	0	0	0	Y	0	0	No
uperl	52055	14.754	1561008	4.754	Mid-block	curved road,	OTURN	North	Side; Driver SI	Uncoded Error	Unknown	Uncoded Errors	Uncoded Error	Clear	Icy	Wed	0630	11/18/2009	7461349	0	0	0	Y	0	0	No
uperl	52055	14.754	1561008	4.754	Mid-block	curved road,	AN-ST	North	Multiple Areas	Going Straight	East	Front Center	Going Straight	Snow /	Slushy	Thu	1005	12/29/2011	8233212	0	1	0	N	1	1	No
uperl	52055	14.754	1561008	4.754	Mid-block	straight, unrel	RE-ST	South	Rear Center	Parked	South	Front Center	Going Straight	Cloudy	Dry	Fri	2150	02/16/2007	6600474	1	0	0	N	1	0	No
uperl	52055	14.754	1561008	4.754	Mid-block	curved road,	PKD-V	North	Multiple Areas	Going Straight	West	Front Corner; P	In prior crash	Clear	Icy	Wed	0635	11/18/2009	7462292	0	1	0	N	1	0	No
uperl	52055	14.756	1561008	4.756	Mid-block	straight, unrel	3C-SNG	South	Front Center	Going Straight	Unknown	Uncoded Errors	Uncoded Error	Snow /	Slushy	Wed	1550	11/09/2011	8203220	0	0	0	Y	0	0	No
uperl	52055	14.811	1561008	4.811	Mid-block	straight, unrel	BIKE	South	Side; Passenger	Going Straight	Unknown	Uncoded Errors	Pedestrian In r	Clear	Dry	Tue	1820	06/22/2010	7645738	1	0	0	N	1	0	No
uperl	52055	14.811	1561008	4.811	Mid-block	curved road,	FXOBJ	North	Front Corner; D	Going Straight	Unknown	Uncoded Errors	Uncoded Error	Clear	Dry	Tue	2110	08/31/2010	7698293	1	0	0	N	1	0	Yes
uperl	52055	14.954	1561008	4.954	Mid-block	curved road,	FXOBJ	South	Rear Corner;	Going Straight	Unknown	Uncoded Errors	Uncoded Error	Snow /	Slushy	Thu	1240	04/12/2007	6649724	0	0	0	Y	0	0	No
uperl	52055	15.254	1561008	5.254	Mid-block	curved road,	FXOBJ	Unknown	Front Corner; P	Going Straight	Unknown	Uncoded Errors	Uncoded Error	Snow /	Icy	Tue	0645	01/18/2011	7868903	0	0	0	Y	0	0	No
uperl	52055	15.254	1561008	5.254	Mid-block	curved road,	HD-ON	North	Front Center	Going Straight	South	Front Center	Going Straight	Snow /	Slushy	Tue	0805	10/13/2009	7443906	1	1	0	N	2	0	No
uperl	52055	15.254	1561008	5.254	Mid-block	curved road,	HD-ON	South	Side; Passenger	Going Straight	North	Front Center	Going Straight	Snow /	Snowy	Sat	1132	01/15/2011	7929970	1	1	0	N	2	2	No
uperl	52055	15.256	1561008	5.256	Mid-block	curved road,	SS-OP	South	Rear Corner;	Uncoded Error	North	Side; Passenger	Uncoded Error	Snow /	Snowy	Tue	0745	01/30/2007	6579750	0	0	0	Y	0	0	No
uperl	52055	15.256	1561008	5.256	Mid-block	curved road,	FXOBJ	South	Front Center	Unknown	Unknown	Uncoded Errors	Uncoded Error	Clear	Snowy	Fri	1050	02/09/2007	6593966	0	0	1	N	1	0	No
uperl	52055	15.256	1561008	5.256	Mid-block	curved road,	FXOBJ	South	Front Corner; P	Going Straight	Unknown	Uncoded Errors	Uncoded Error	Snow /	Icy	Thu	0520	02/15/2007	6600630	0	0	0	Y	0	0	No
uperl	52055	15.336	1561008	5.336	Mid-block	curved road,	3C-SNG	North	Rear Corner;	Going Straight	Unknown	Uncoded Errors	Uncoded Error	Rain	Wet	Thu	1215	10/18/2007	6803729	0	0	0	Y	0	0	No
uperl	52055	15.454	1561008	5.454	Mid-block	curved road,	FXOBJ	South	Front Center	Slowing Stopped	Unknown	Uncoded Errors	Uncoded Error	Snow /	Icy	Mon	1810	12/14/2009	7500045	0	2	0	N	2	0	No
uperl	52055	15.518	1561008	5.518	Mid-block	curved road,	FXOBJ	North	Front Corner; P	Going Straight	Unknown	Uncoded Errors	Uncoded Error	Snow /	Icy	Mon	0920	02/02/2009	7248245	0	0	0	Y	0	0	No
uperl	52055	15.654	1561008	5.654	Mid-block	curved road,	SS-SM	South	Front Corner; P	Slowing Stopped	South	Rear Corner; Dr	Avoiding the veh	Cloudy	Icy	Tue	1550	01/05/2010	7520145	0	0	0	Y	0	0	No
uperl	52055	15.654	1561008	5.654	Mid-block	curved road,	FXOBJ	South	Front Corner; P	Avoiding the veh	Unknown	Uncoded Errors	Uncoded Error	Cloudy	Icy	Tue	1550	01/05/2010	7520061	0	0	0	Y	0	0	No
uperl	52055	15.654	1561008	5.654	Mid-block	curved road,	RE-ST	South	Rear Corner;	Stopped on Road	South	Front Corner; P	Going Straight	Cloudy	Icy	Tue	1550	01/05/2010	7520062	0	0	0	Y	0	0	No
uperl	52055	15.654	1561008	5.654	Mid-block	straight, unrel	FXOBJ	South	Front Corner; D	Going Straight	Unknown	Uncoded Errors	Uncoded Error	Snow /	Icy	Tue	1525	01/05/2010	7520060	0	0	0	Y	0	0	No

EXPECTED FREQUENCY	EXPECTED SEVERITY	RISK RATING	E
Occasional	High	High	
OBSERVATION: Drivers are departing their lane.			



SUGGESTION: Improve horizontal and vertical curve geometrics to meet 60 MPH design speed, (50 MPH currently). Includes superelevation improvements.

EXPECTED FREQUENCY	EXPECTED SEVERITY	RISK RATING	E
Occasional	High	High	
OBSERVATION: Drivers are departing their lane.			



SUGGESTION: Increase sign sizes and reduce sign location offset. Upgrade sign sheeting. Upgrade signs to meet current MMUTCD. Add reflective sheeting to sign posts. Add chevrons and target arrows to all curve sections. Add advisory speeds to advance curve warning signs. Add object marker signs to end of guardrail sections.

EXPECTED FREQUENCY	EXPECTED SEVERITY	RISK RATING	E
Occasional	High	High	
OBSERVATION: Drivers are departing their lane.			



SUGGESTION: Remove and consolidate the passing zones. Remove all corresponding signs and repaint pavement markings to reflect the change.

EXPECTED FREQUENCY	EXPECTED SEVERITY	RISK RATING	E
Occasional	High	High	
OBSERVATION: Drivers are departing their lane.			

Suggestion Example



SUGGESTION: Place a special detail sign at the beginning of the segment in each direction to indicate hill terrain and curves ahead.

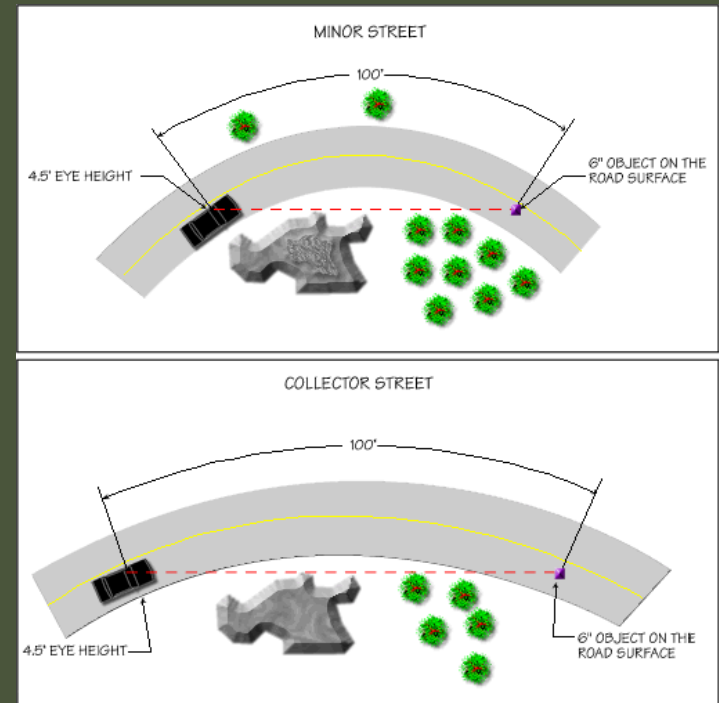
EXPECTED FREQUENCY	EXPECTED SEVERITY	RISK RATING	E
Occasional	High	High	
OBSERVATION: Crashes are occurring at the end of the taper section in the horizontal curve, (near the driveways to the north).			



SUGGESTION: *Short Term* - Update taper warning signs to reflect MMUTCD. *Long Term* - Extend the truck climbing lane to the tangent portion of M-553, (~3500' further).

EXPECTED FREQUENCY	EXPECTED SEVERITY	RISK RATING	D
Occasional	Medium	Moderate	

OBSERVATION: Northern curve near Marquette Mtn. is limited to any geometric realignment.



SUGGESTION: Add a high friction surface to roadway. Clear trees and other fixed objects in clear zone. Cut down and move the backslopes further from the roadway.

EXPECTED FREQUENCY	EXPECTED SEVERITY	RISK RATING	D
Rare	High	Moderate	
OBSERVATION: Possible foreslopes may requiring shielding.			



Suggestion Example

SUGGESTION: Extend guardrail to shield foreslopes. Extend approach terminal.

EXPECTED FREQUENCY	EXPECTED SEVERITY	RISK RATING	D
Rare	High	High	
OBSERVATION: Potential bicycle conflicts.			



SUGGESTION: Increase shoulder width to uniform standard. Add rumble strips in shoulder where missing. Potentially add bicycle share the road signs.

EXPECTED FREQUENCY	EXPECTED SEVERITY	RISK RATING	C
Rare	Medium	Low	
OBSERVATION: Pedestrian conflicts near Marquette Mtn. at the pedestrian roadway crossing.			



Existing



Suggestion Example

SUGGESTION: Update pedestrian crossing sequence; Including high visibility pedestrian pavement markings, pedestrian signing upgrades, and adding diagonal target arrows at crossing.

Summary

- Low Cost:
 - Update signing, pavement markings, guardrail, rumble strips, and consolidating passing zones.
- Moderate Cost:
 - Shoulder widening, high friction surface, horizontal sight distance improvements (trees/back slopes).
- High Cost:
 - Realign horizontal curves, improve vertical curves, improve superelevation, and extend truck lane.

Questions?

